

# **EXHIBIT 9**

## **REDACTED**

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**IN THE UNITED STATES DISTRICT COURT  
FOR THE EASTERN DISTRICT OF TEXAS**

State of Texas, *et al.*,

*Plaintiffs,*

v.

Google LLC,

*Defendant.*

**Case No. 4:20-CV-957-SDJ  
Hon. Sean D. Jordan**

**Expert Report of Professor Steven N. Wiggins**

July 30, 2024

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exceptional overall financial performance is a relevant factor for assessing penalties, notwithstanding the inconsistency with his own framework for assessing penalties and basic economic principles. Mr. Andrien further asserts that Google has a “history of violations” that justifies large penalties, but none of his examples involved allegations similar to the alleged deception asserted in this case. See Section VIII.

## II. Background

### A. Overview of Display Advertising

21. Display ads are defined as a “[v]isual digital advertising format which uses designs such as animation, images, text, and video to attract consumers’ attention.”<sup>11</sup> Web and app publishers monetize their online properties by selling display ad “inventory,” which consists of blocks of space adjacent to other content on sites and apps that can be filled with display ads.<sup>12</sup>
22. Some ads permit or encourage “clicks” or actions. When a user elects to click on an ad, he or she is directed to another website where the user can learn more, or take an action, such as purchasing a product or downloading content. This latter class of actions is often referred to as “conversions,” which can take many forms.<sup>13</sup>
23. In the early days of online display advertising in the 1990s, advertisers generally negotiated for ad placement directly with publishers in bulk.<sup>14</sup> As online advertising grew and evolved, ad tech firms developed tools that made it possible for publishers to sell advertising inventory impression-by-impression through auctions that occur when an

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<sup>11</sup> “Glossary,” *eMarketer*, available at <https://totalaccess.emarketer.com/thesaurus.aspx> (last accessed July 29, 2024).

<sup>12</sup> “Inventory basics: What is inventory?,” *Google*, available at <https://support.google.com/admanager/answer/10064557> (last accessed July 25, 2024).

<sup>13</sup> “Conversion Tracking: Definition,” *Google*, available at <https://support.google.com/google-ads/answer/6308> (last accessed July 25, 2024).

<sup>14</sup> “The History of Digital Advertising Technology,” *Clearcode*, available at <https://adtechbook.clearcode.cc/history-advertising-technology/> (last accessed July 25, 2024) (“It was during the early 1990s when many companies, organizations, and Internet enthusiasts started creating the first public websites. Advertisers soon spotted the potential that this new world had to offer and began testing uncharted waters. The year 1994 saw the first recorded example of online display advertising in the form of a banner ad, which appeared on a website called HotWired (now wired.com).... In the early days of online display advertising, the exchange between an advertiser and a publisher was a direct sales process and resembled the way media had always been bought and sold.”).

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advertising opportunity arises as a user visits a website or uses an app.<sup>15</sup> An impression occurs when a user is shown a display ad, irrespective of whether the user elects to “click through” to the advertiser’s content, online store, or other online resource.<sup>16</sup>

24. The process of placing an online display ad in front of a user occurs faster than the blink of an eye.<sup>17</sup> A primary purpose of these rapid transactions is to enable the placement of ads that target consumers precisely based on their interests and characteristics. More specifically, the goal of such targeting is to match particular ads to users whose “specific traits, interests, and preferences” are more likely to result in outcomes sought by the advertiser.<sup>18</sup> This targeting creates value by enabling advertisers to reach a more specific audience than is possible with more traditional methods such as newspapers and television. The ability to reach specific audiences also benefits publishers by increasing the value of their ad inventory.<sup>19</sup> And users benefit by viewing ads more aligned with their interests.<sup>20</sup>
25. Ad tech platforms accomplish targeting by facilitating the “matching” of publishers (who seek to monetize the ad inventory on their websites and apps) and advertisers (who purchase ad inventory to reach their target audiences).

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<sup>15</sup> “The History of Digital Advertising Technology,” *Clearcode*, available at <https://adtechbook.clearcode.cc/history-advertising-technology/> (last accessed July 25, 2024); “Real-time bidding (RTB),” *ClearCode*, available at <https://clearcode.cc/glossary/real-time-bidding-rtb/> (last accessed July 25, 2024).

<sup>16</sup> Sharma, Deepak, “The Ultimate Guide to Ad Impressions: Maximizing Your Impact,” *AdPushUp*, March 31, 2024, available at <https://www.adpushup.com/blog/ad-impressions/> (last accessed July 25, 2024) (“An ad impression is a fundamental metric in online advertising. It occurs when an advertisement is successfully displayed to a user on a website, mobile app, or any digital platform. It signifies that the ad has been visually presented, regardless of whether the user interacts with it or not.”).

<sup>17</sup> See Zawadziński, Maciej and Mike Sweeney, “How Does Real-Time Bidding (RTB) Work?,” *Clearcode*, April 16, 2024, available at <https://clearcode.cc/blog/real-time-bidding/> (last accessed July 25, 2024) (“One of the most remarkable facts about RTB is the speed of the auctions in the ad exchanges – each transaction takes about 100 milliseconds (a 10th of a second). To put that into perspective, it takes about 300 milliseconds to blink.” (internal emphasis omitted)).

<sup>18</sup> “What is Targeted Advertising?,” *GCF Global*, available at <https://edu.gcfglobal.org/en/thenow/what-is-targeted-advertising/1/> (last accessed July 25, 2024).

<sup>19</sup> Wu, Susan, “How Publishers And Advertisers Can Activate Sell-Side Targeting,” *PubMatic*, February 8, 2023, available at <https://pubmatic.com/blog/how-publishers-and-advertisers-can-activate-sell-side-targeting/> (last accessed July 25, 2024) (“Sell-side targeting enables publishers to monetize even more inventory[.]”).

<sup>20</sup> “Poll: Americans Want Free Internet Content, Value Interest-Based Advertising,” *American Association of Advertising Agencies*, April 18, 2023, available at <https://www.aaaa.org/pollamericanswantfreeinternetcontentvalueinterest-basedadvertising/> (last accessed July 25, 2024) (“Nearly 70 percent of respondents indicated that they’d like at least some ads tailored directly to their interests[.]”).

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tool.<sup>50</sup> As described more fully below, advertisers generally focus on the returns generated by their campaigns, and they compare the performance of various ad buying tools in helping them achieve their goals.<sup>51</sup>

37. A portion of the advertiser's budget may remain unspent if the ad buying tool is unable to find sufficient clicks at prices below the advertiser's maxCPC. In the earliest period for which data is available, which appears to be 2013, these "budget unconstrained advertisers" were common on Google Ads,<sup>52</sup> and their presence created strong incentives for Google Ads to generate more clicks at a cost below the advertiser's maxCPC. As described below, Google Ads invented a bidding strategy—known as Bernanke—to provide more clicks (without exceeding the maxCPC), thus benefiting both Google Ads and its advertiser customers. Google Ads benefited by receiving a buy-side margin on a larger portion of advertisers' budgets, and the advertisers benefited because they were able to acquire more clicks at a price at or below their maximum CPCs.<sup>53</sup>
38. Ad buying tools bid into ad exchanges, sometimes called supply-side platforms or "SSPs."<sup>54</sup> Ad exchanges conduct online auctions for inventory and collect payments from

( [REDACTED] ).

<sup>50</sup> 30(b)(1) Jayaram (Google) Deposition at 60:22-25 and 62:4-9 ("My hope is that by launching quality improvements such as Bernanke and other improvements that we made over the years, more advertisers have used AdWords. ... Advertisers' payments to Google, like I said, you know, it depends on performance and my hope is by improved performance, advertisers also use the product more and bring in more ... budgets.").

<sup>51</sup> See, e.g., [REDACTED]

<sup>52</sup> GOOG-DOJ-13625417 at -419 [REDACTED]

See *id.* at -426. Other slides in this presentation likewise refer to information from 2013. See, e.g., *id.* at -433.

<sup>53</sup> Profit-maximizing advertisers will set their maximum CPC so that it is less than or equal to the benefit the advertiser expects to receive from the click. As a result, advertisers are made better off whenever Google Ads can provide clicks below their maximum CPCs. This is in accord with the fundamental economic principle that profit maximizing firms act to equate the marginal revenue from an action equal to the marginal cost of that action. See, e.g., Mankiw N., Gregory, Ronald D. Kneebone, and Kenneth J. McKenzie, *Principles of Microeconomics*, 10th Canadian ed. 2017, at 307 ("[There are] three general rules for profit maximization: 1. If marginal revenue is greater than marginal cost, the firm should increase its output. 2. If marginal cost is greater than marginal revenue, the firm should decrease its output. 3. At the profit-maximizing level of output, marginal revenue and marginal cost are exactly equal. These rules are the key to rational decision making by any profit-maximizing firm. They apply not only to competitive firms but, as we will see in the next few chapters, to other types of firms as well.").

<sup>54</sup> See, e.g., "What is a Supply-Side Platform (SSP)? Here's everything you need to know," *Amazon Ads*, available at

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winning bidders, and then deduct the ad exchange's revenue share before remitting the balance to publishers. Transactions on ad exchanges are commonly carried out using first-price or second-price auctions.<sup>55</sup> Google's ad exchange, AdX, has been integrated into Google Ad Manager (GAM).<sup>56</sup> There are many other ad exchanges, including Xandr, OpenX, Magnite, Pubmatic, and Index Exchange.<sup>57</sup>

## B. Learning-By-Doing in the Ad Tech Industry

39. A proper economic assessment of the issues in this case requires understanding the

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<https://advertising.amazon.com/library/guides/supply-side-platform> (last accessed July 25, 2024); Wlosik, Michal and Maciej Zawadzinski, "What Is a Supply-Side Platform (SSP) and How Does It Work?," *Clearcode*, January 31, 2024, available at <https://clearcode.cc/blog/what-is-supply-side-platform/> (last accessed July 25, 2024).

<sup>55</sup> For a discussion of the economics of first- and second-price auctions, see, for example, Villas-Boas, Sofia B., "An Introduction to Auctions," *Journal of Industrial Organization Education*, Vol. 1, Issue 1, Article 5, 2006, explaining that in first price auctions, the bidder who submits the highest bid wins the auction and is charged its bid. Economic theory teaches that, in first-price auctions, advertisers have an incentive to reduce (or "shade") their bids below their willingness to pay for the impression. The basic intuition is that, if the advertiser bids its willingness to pay and wins, it obtains no "surplus" from the auction (where advertiser surplus is the difference between the maximum amount that the advertiser would be willing to pay for an impression and what it actually pays for the impression). In such instances, the winning bidder is no better off than had it not offered a bid in the first instance. But if the advertiser wins when bidding below its willingness to pay, then it achieves a positive surplus. According to auction theory, the optimal amount of shading is the result of a trade-off between (i) a lower likelihood of winning from more shading, and (ii) a higher surplus from more shading when the advertiser does win the auction.

In second price auctions, on the other hand, the bidder who submits the highest bid wins the auction and is charged the second-highest bid or, when it is higher, the reserve or floor price for the auction. Only bids above the "floor" price can win an auction. When all bids are below the floor price for an online display ad auction, the auction is said to have not "cleared," meaning that no bidder in that auction wins the impression. In a static (i.e., non-repeated) second-price auction, advertisers have an incentive to bid their willingness to pay for the impression that is being auctioned off. The basic intuition why advertisers would not bid less than their willingness to pay in a second-price auction is that doing so would reduce the advertiser's likelihood of winning the auction, but it would not lower the price it would pay if it wins the auction. This price depends on only the second highest bid (and not the winner's bid). If a bidder needs to increase its bid above its willingness to pay in order to win an auction, then it will necessarily suffer a loss from winning the auction because it will end up paying more than its willingness to pay.


<sup>56</sup> See, e.g., Ramaswamy, Sridhar, "Introducing simpler brands and solutions for advertisers and publishers," *Google*, June 27, 2018, available at <https://blog.google/technology/ads/new-advertising-brands/> (last accessed July 25, 2024); Marvin, Ginny, "Google is Retiring the AdWords & DoubleClick Brands in a Major Rebranding Aimed at Simplification," *Search Engine Land*, June 27, 2018, available at <https://searchengineland.com/google-is-retiring-the-adwords-doubleclick-brands-in-a-major-rebranding-aimed-at-simplification-301073> (last accessed July 25, 2024) ("Google is also introducing some new solutions that further the push toward simplifying its advertising offerings.... DoubleClick for Publishers and DoubleClick Ad Exchange are integrated into a new unified platform called Google Ad Manager.").

<sup>57</sup> See Trevisani, Jonathan, "The Best Ad Exchanges for Publishers in 2024," *Playwire*, available at <https://www.playwire.com/blog/best-ad-exchanges-for-publishers> (last accessed July 25, 2024); "What is a Supply-Side Platform (SSP)? Here's everything you need to know," *Amazon Ads*, available at <https://advertising.amazon.com/library/guides/supply-side-platform> (last accessed July 25, 2024); "What Is a Supply-Side Platform (SSP) and How Does It Work?," *Clearcode*, available at <https://clearcode.cc/blog/what-is-supply-side-platform/> (last accessed July 25, 2024).

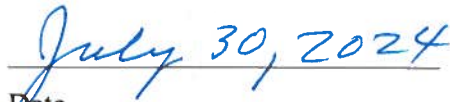
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was not “detrimental to Google.”<sup>520</sup> That is wrong as a matter of economics. Standard economic analysis recognizes that firms seek to maximize their profits.<sup>521</sup> Because every settlement and fine reduced Google’s profits, each was, by definition “detrimental.”

Respectfully submitted,



Steven N. Wiggins, Ph.D.



Date

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<sup>520</sup> Andrien Report at ¶ 126.

<sup>521</sup> See, e.g., Henderson, James M. and Richard E. Quandt, *Microeconomic Theory: A Mathematical Approach*, McGraw-Hill Book Company, Inc., 3<sup>rd</sup> ed. 1980, at 78-79.